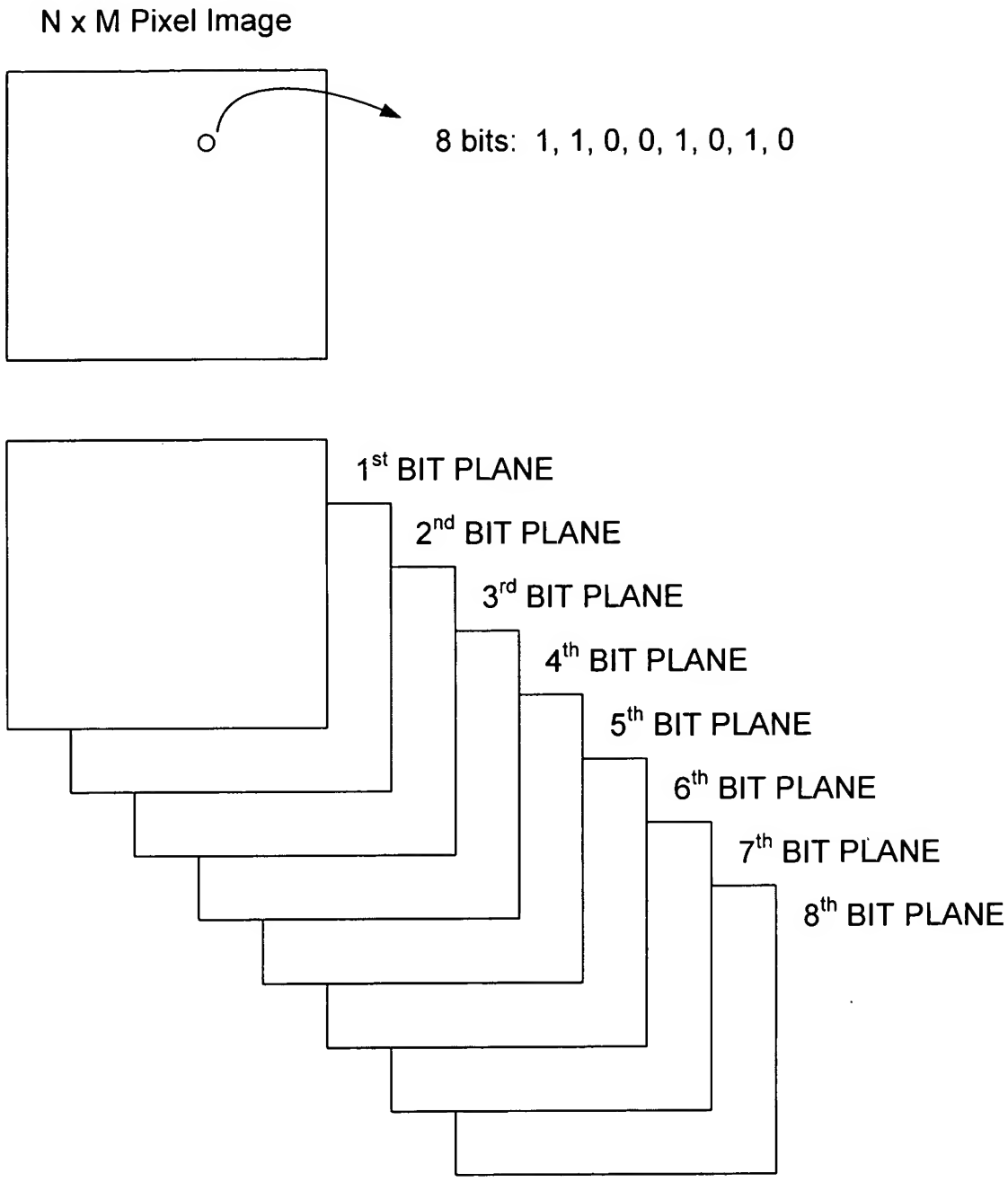

N x M Pixel Image
8 bits: 1, 1, 0, 0, 1, 0, 1, 0
1st BIT PLANE
2nd BIT PLANE
3rd BIT PLANE
4th BIT PLANE
5th BIT PLANE
6th BIT PLANE
7th BIT PLANE
8th BIT PLANE

FIG. 1

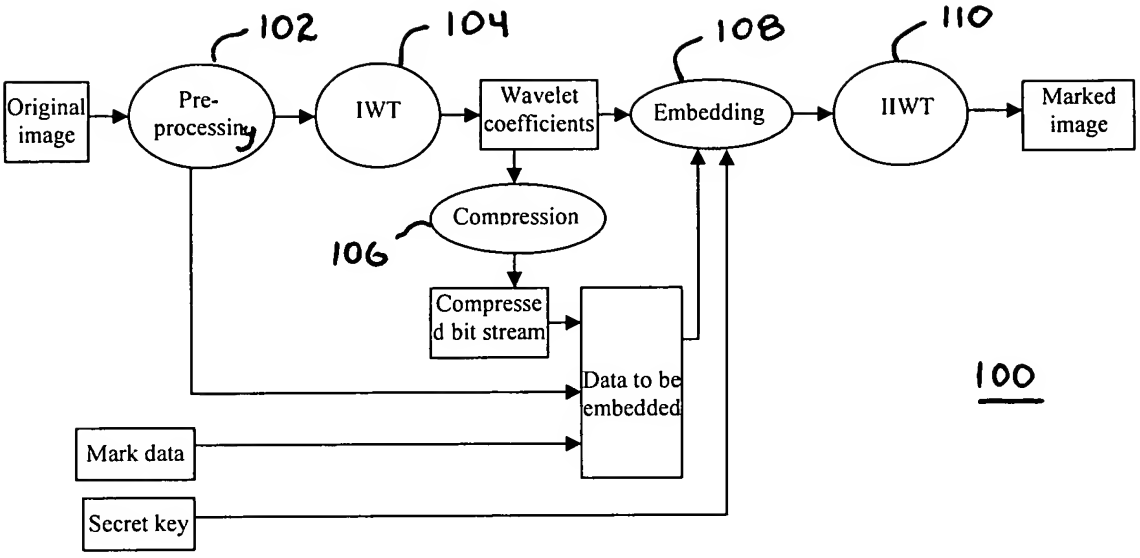

102
104
108
110
Original image
Pre-processing
IWT
Wavelet coefficients
Embedding
IIWT
Marked image
Compression
106
Compressed bit stream
Data to be embedded
100
Mark data
Secret key

FIG. 2

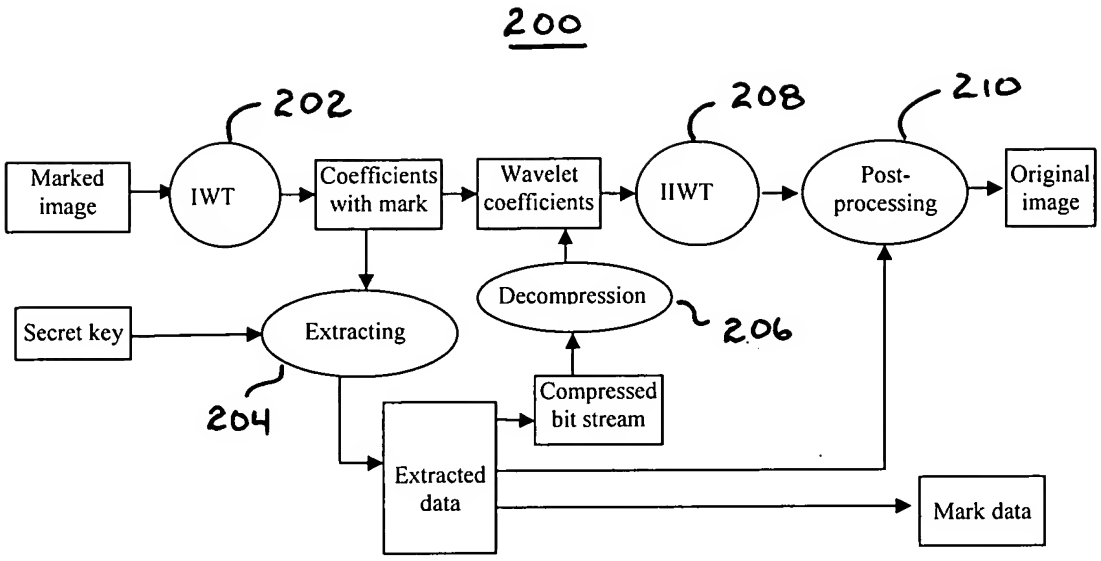

200
202
208
210
Marked image
IWT
Coefficients with mark
Wavelet coefficients
IIWT
Post-processing
Original image
Secret key
Extracting
204
Decompression
206
Compressed bit stream
Extracted data
Mark data

FIG. 3

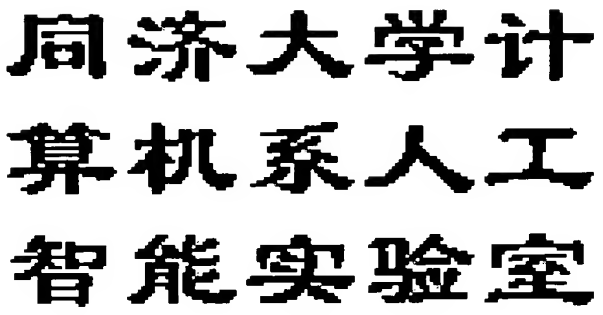


FIG. 4

FIG. 5

FIG. 6

Images (512x512x8)	PSNR of marked image (dB)	Pay-load (bits)
Lena	36.64	85,507
Pepper	29.11	69,285
Tiffany	28.91	89,848
Couple	29.83	84,879
Baboon	32.76	14,916
Airplane	36.30	93,981
Sailboat	35.47	44,086
House	36.01	77,726

FIG. 7

Methods	The amount of data embedded in a $512 \times 512 \times 8$ image
Macq's	Upper bound: 2,046 bits
Goljan's	3,000-24,000 bits
Our proposed	15,000-94,000 bits

FIG. 8

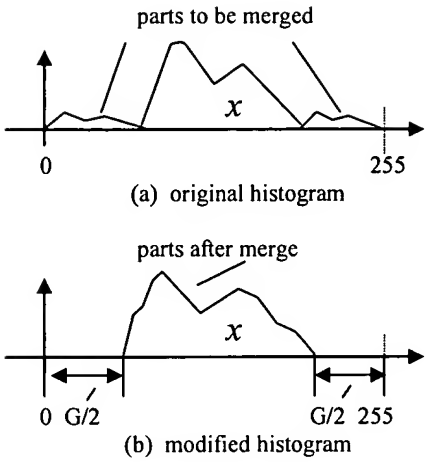
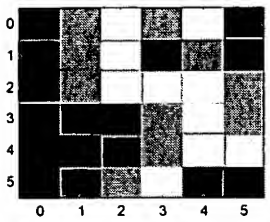
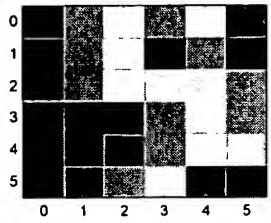

parts to be merged
x
0
255
(a) original histogram
parts after merge
x
0 G/2
G/2 255
(b) modified histogram

FIG. 9



(a) original image



(b) histogram modified image

2	4	7	4	7	3
3	4	5	3	4	1
3	4	7	5	6	4
0	2	2	4	5	4
0	1	3	4	7	5
0	3	4	5	3	2

(c) original image data

2	4	6	4	6	3
3	4	5	3	4	2
3	4	6	5	5	4
1	2	2	4	5	4
1	2	3	4	6	5
1	3	4	5	3	2

(d) modified image data

FIG. 10

Histogram data before and after modification.

Gray value	0	1	2	3	4	5	6	7
No. before modification	3	2	4	7	10	5	1	4
No. in modification	3	0	6	7	10	6	0	4
No. after modification	0	3	6	7	10	6	4	0

FIG. 11

Bookkeeping information.

For image (6×6×3), the histogram is narrowed down 1 gray scale for both sides. G=2, G/2=1. The total bits length is 37 bits.
S=the total book-keeping bit length 37 bits (00100101) + compressed number of gray scale 2 (010) + the first histogram from left hand side gray scale "1" (001) +record length 6 (0110) + scan sequence (101101)+ the first histogram from right hand side gray scale "6" (110) + record length 6 (0110) + scan sequence (110111) S=[00100101 010 001 0110 101101 110 0110 110111]

FIG. 12